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## Test 1002: John Deere 2520 Power Shift

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# NEBRASKA TRACTOR TEST 1002—JOHN DEERE 2520 POWER-SHIFT GASOLINE

## POWER TAKE-OFF PERFORMANCE

Hp	Crank-shaft speed rpm	Fuel Consumption		Temperature Degrees F					Barometer inches of Mercury
		Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling medium	Air wet bulb	Air dry bulb		
MAXIMUM POWER AND FUEL CONSUMPTION									
*	Rated Engine Speed—Two Hours								
56.98	2500	5.533	0.587	10.30	201	56	75	29.263	
Standard Power Take-Off Speed (1000 rpm)—One Hour									
51.96	2066	4.783	0.556	10.86	202	55	74	29.258	
VARYING POWER AND FUEL CONSUMPTION—TWO HOURS									
50.02	2583	5.534	0.669	9.04	193	55	75	.....	
0.00	2716	2.134	.....	.....	185	54	73	.....	
25.65	2650	3.653	0.861	7.02	189	55	74	.....	
56.77	2500	5.544	0.590	10.24	201	55	75	.....	
12.96	2679	2.909	1.356	4.46	187	55	....	.....	
38.14	2623	4.616	0.732	8.26	191	55	74	.....	
Av	30.59	2625	4.065	0.803	7.53	191	55	74	29.262

## DRAWBAR PERFORMANCE

Hp	Draw-bar pull lbs	Speed miles per hr	Crank-shaft speed rpm	Slip of drivers %	Fuel Consumption			Temp Degrees F			Barometer inches of Mercury
					Gal per hr	Lb per hp-hr	Hp-hr per gal	Cooling med	Air wet bulb	Air dry bulb	
VARYING DRAWBAR POWER AND FUEL CONSUMPTION WITH BALLAST											
Maximum Available Power—Two Hours—4th Gear											
48.09	4030	4.48	2493	6.63	5.652	0.710	8.51	200	57	66	28.820
75% of Pull at Maximum Power—Ten Hours—4th Gear											
38.46	3030	4.76	2598	4.61	5.376	0.845	7.15	195	46	53	28.824
50% of Pull at Maximum Power—Two Hours—4th Gear											
27.23	2099	4.86	2616	3.26	4.524	1.004	6.02	192	57	69	28.415
MAXIMUM POWER WITH BALLAST											
39.24	7080	2.08	2553	14.75	2nd Gear .....			193	55	65	28.430
46.68	5220	3.35	2497	9.59	3rd Gear .....			198	50	60	28.880
48.49	4062	4.48	2499	6.66	4th Gear .....			195	51	61	28.880
45.79	2907	5.91	2505	4.72	5th Gear .....			197	52	63	28.880
45.73	2220	7.73	2500	3.47	6th Gear .....			198	52	64	28.880
45.74	1665	10.30	2500	2.91	7th Gear .....			198	54	65	28.880
MAXIMUM PULL WITHOUT BALLAST											
33.25	5970	2.09	2580	14.85	2nd Gear .....			190	41	42	29.000

## VARYING DRAWBAR PULL AND TRAVEL SPEED WITH BALLAST—4th Gear

Pounds pull	4062	4307	4519	4749	4979	4962
Horsepower	48.49	46.02	42.68	38.68	34.63	28.72
Crankshaft speed rpm	2499	2250	1997	1735	1486	1243
Miles per hour	4.48	4.01	3.54	3.05	2.61	2.17
Slip of drivers, %	6.66	7.25	7.64	8.27	8.77	9.03

## TIRES, BALLAST and WEIGHT

		With Ballast	Without Ballast
Rear tires	—No, size, ply & psi	Two 13.6-38; 6; 20	Two 13.6-38; 6; 16
	—Liquid	None	None
	Cast iron	757 lb each	None
Front tires	—No, size, ply & psi	Two 6.00-16; 6; 36	Two 6.00-16; 6; 36
	—Liquid	None	None
	Cast iron	42 lb each	None
Height of drawbar		18 inches	18 inches
Static weight with operator—Rear		6865 lb	5350 lb
	Front	2125 lb	2045 lb
	Total	8990 lb	7390 lb

## Department of Agricultural Engineering

Date of Test: March 12 to March 21, 1969

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, WATERLOO, IOWA

**FUEL, OIL and TIME** Fuel regular gasoline Octane No Motor 85.2 Research 92.6 (rating taken from oil company's typical inspection data) Specific gravity converted to 60°/60° 0.7260 Weight per gallon 6.044 lb Oil SAE 30 API service classification MS, DM To motor 1.390 gal Drained from motor 1.202 gal Transmission and final-drive lubricant John Deere Special 303 oil Total time engine was operated 42 hours.

**ENGINE** Make John Deere Gasoline Type 4-cylinder vertical Serial No M51RC115534T Crankshaft mounted lengthwise Rated rpm 2500 Bore and stroke 3.86" x 4.33" Compression ratio 7.6 to 1 Displacement 202.7 cu in Carburetor size 1" Ignition system battery Cranking system 12 volt electric Lubrication pressure Air cleaner dry type with replaceable treated paper element Oil filter full flow replaceable paper cartridge Fuel filter screen in carburetor and fuel pump Muffler was used Cooling medium temperature control thermostat.

**CHASSIS** Type Standard Serial No T711PO-17109R Tread width rear 56" to 88" front 48.5" to 82.5" Wheel base 92.75" Center of gravity (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 25.3" Vertical distance above roadway 36.5" Horizontal distance from center of rear wheel tread 0.04" to the right Hydraulic control system direct engine drive Transmission Selective gear fixed ratio with operator controlled full range power shifting Advertised speeds mph first 1.67 second 2.36 third 3.67 fourth 4.75 fifth 6.12 sixth 7.92 seventh 10.49 eighth 17.49 reverse first 1.94 second 2.75 third 4.29 fourth 5.55 Clutch multiple disc wet clutches within transmission hydraulically operated Brakes wet disc hydraulically power actuated and operated by two foot pedals that can be locked together Steering hydrostatic power Turning radius (on concrete surface with brake applied) right 116 3/4" left 116 3/4" (on concrete surface without brake) right 139" left 139" Turning space diameter (on concrete surface with brake applied) right 243 1/2" left 243 1/2" (on concrete surface without brake) right 287" left 287" Belt pulley 976 rpm at 2100 engine rpm diam 12" face 8 1/2" Belt speed 3063 fpm Power take-off 547 or 1016 rpm at 2100 engine rpm.

**REPAIRS and ADJUSTMENTS:** No repairs or adjustments.

**REMARKS:** All test results were determined from observed data obtained in accordance with the SAE and ASAE test code. First gear was not run as it was necessary to limit the pull in second gear to avoid excessive slippage. Eighth gear was not run as it exceeded fifteen miles per hour.

We, the undersigned, certify that this is a true and correct report of official Tractor Test 1002.

L. F. LARSEN

Engineer-In-Charge

G. W. STEINBRUEGGE, Chairman

W. E. SPLINTER

D. E. LANE

Board of Tractor Test Engineers

The University of Nebraska Agricultural Experiment Station  
E. F. Frolik, Dean; H. W. Ottoson, Director; Lincoln, Nebraska

# EXPLANATION OF TEST REPORT

## GENERAL CONDITIONS

Each tractor is a production model equipped for common usage. Power consuming accessories can be disconnected only when it is convenient for the operator to do so in practice. Additional weight can be added as ballast if the manufacturer regularly supplies it for sale. The static tire loads and the inflation pressures must conform to recommendations in the Tire Standards published by the Society of Automotive Engineers.

## PREPARATION FOR PERFORMANCE RUNS

The engine crankcase is drained and refilled with a measured amount of new oil conforming to specifications in the operators manual. The fuel used and the maintenance operations must also conform to the published information delivered with the tractor. The tractor is then limbered-up for 12 hours on drawbar work in accordance with the manufacturer's published recommendations. The manufacturer's representative is present to make appropriate decisions regarding mechanical adjustments.

The tractor is equipped with approximately the amount of added ballast that is used during maximum drawbar tests. The tire tread-bar height must be at least 65% of new tread height prior to the maximum power run.

## BELT OR POWER TAKE-OFF PERFORMANCE

**Maximum Power and Fuel Consumption.** The manufacturer's representative makes carburetor, fuel pump, ignition and governor control settings which remain unchanged throughout all subsequent runs. The governor and the manually operated governor control lever is set to provide the high-idle speed specified by the manufacturer for maximum power. Maximum power is measured by connecting the belt pulley or the power take-off to a dynamometer. The dynamometer load is then gradually increased until the engine is operating at the rated speed specified by the manufacturer for maximum power. The corresponding fuel consumption is measured.

**Varying Power and Fuel Consumption.** Six different horsepower levels are used to show corresponding fuel consumption rates and how the governor causes the engine to react to the following changes in dynamometer load: 85% of the dynamometer torque at maximum power; minimum dynamometer torque,  $\frac{1}{2}$  of the 85% torque; maximum power,  $\frac{1}{4}$  and  $\frac{3}{4}$  of the 85% torque. Since a tractor is generally subjected to varying loads the average of the results in this test serve well for predicting the fuel consumption of a tractor in general usage.

## DRAWBAR PERFORMANCE

All engine adjustments are the same as those used in the belt or power take-off tests. If the manufacturer specifies a different rated crankshaft speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified by the manufacturer in the operating instructions.

**Varying Power and Fuel Consumption With Ballast.** The varying power runs are made to show the effect of

speed-control devices (engine, governor, automatic transmission, etc.) on horsepower, speed and fuel consumption. These runs are made around the entire test course which has two 180 degree turns with a minimum radius of 50 feet. The drawbar pull is set at 3 different levels as follows: (1) as near to the pull at maximum power as possible and still have the tractor maintain the travel speed at maximum horsepower on the straight sections of the test course; (2) 75% of the pull at maximum power; and (3) 50% of the pull at maximum power. Prior to 1958, fuel consumption data (10 hour test) were shown only for the pull obtained at maximum power for tractors having torque converters and at 75% of the pull obtained at maximum power for gear-type tractors.

**Maximum Power with Ballast.** Maximum power is measured on straight level sections of the test course. Data are shown for not more than 12 different gears or travel speeds. Some gears or travel speeds may be omitted because of high slippage of the traction members or because the travel speed may exceed the safe-limit for the test course. The maximum safe speed for the Nebraska Test Course has been set at 15 miles per hour. The slippage limits have been set at 15% and 7% for pneumatic tires and steel tracks or lugs, respectively. Higher slippage gives widely varying results.

**Maximum Pull without Ballast.** All added ballast is removed from the tractor. The drawbar pull is determined at slip limits of 15% for pneumatic tires or 7% for steel tracks or lugs. The tractor is operated at the fastest possible travel speed.

**Varying Power and Travel Speed with Ballast.** Travel speeds corresponding to drawbar pulls beyond the maximum power range are obtained to show the "lugging ability" of the tractor. The run starts with the pull at maximum power; then additional drawbar pull is applied to cause decreasing speeds. The run is ended by one of three conditions: (1) maximum pull is obtained, (2) the maximum slippage limit is reached, or (3) some other operating limit is reached.

For additional information about the Nebraska Tractor Tests write to the Department of Agricultural Engineering, University of Nebraska, Lincoln, Nebraska.



JOHN DEERE 2520 POWER-SHIFT GASOLINE